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Introduction. 18FDG-PET/CT has emerged as a new standard in radiotherapy planning for patients with lung cancer, improving patient selection and the target volume definition.
Purpose. To analyze the advantages of using a single study 18FDG-PET/CT for staging and planning radiotherapy for patients with lung cancer.
Methods and materials. Fifty-four patients with lung cancer underwent an 18FDG-PET/CT in Radiotherapy treatment position for both staging and planning purposes. From the staging study, 30 patients were candidates for radiotherapy, and 21 of them, who had concomitant chemoradiotherapy, were included. 18FDG-PET/CT studies were transferred to Eclipse (Varian Medical Systems) treatment planning system. Gross tumor volume (GTV) was delineated using CT information only (GTVCT), and using SUV thresholds of 20–30–40% of the maximum PET uptake. We then integrated both CT and PET information (GTVplan) for T and N volumes. A study of the volume difference was performed and compared with different parameters (such stage and histology) to predict the patients in whom the inclusion of the PET images in volume delineation could have the highest impact.
Results. Treatment indication was modified in 24/54(44%) patients due to understaging in 6 patients and overstaging 18. For the 21 selected patients, GTVplan volume decreased compared to GTVCT from 0 to 25% in 33% of cases and 25-75% in 19%, mostly for T4 stages. GTVplan volume increased from 0 to 25% in 29% of cases and 25 to 250% in 19%, mostly for early stages. 38% of GTV volumes changed more than 25%. For T volumes, the Pearson correlation between GTVplan-T and GTVPET-T (threshold of 20–30–40%) was 0.72–0.97–0.97 respectively, and for N volumes was 0.99–0.98–0.40, respectively.
Conclusions. 18FDG-PET/CT is a useful tool in radiation treatment planning, leading to a significant modification of treatment volume. Using 18FDG-PET/CT imaging for staging and planning does not increase the workload and it is cost-effective in the patients selected for radiotherapy.

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Slow CT for incorporating OAR mobility in radiotherapy planning

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Evaluate the variation of organs movement by the use of planning CT with slow revolution (4s/slice) that capture tumor movement in comparison to fast CT (fCT). 26 with NSCLC stage I have been studied. Each patient was scanned with slow and fast CT whilst free breathing. Organs at risk (OAR): liver, right and left lung, spinal cord and heart, were contoured in both slow CT scan (sCT). The IV (Internal Volume) of each organ was generated as the Boolean union of OARs fast and slow. 3D displacement vectors of the individual OAR, related to the IV, were obtained by the volumes as seen in orthogonals beam's eye beam projections. No significant differences were found between the mean OARs captured by sCT and by fCT. The mean ratio between the slow OARs and the IV was: heart 0.9 ± 0.03, liver 0.89 ± 0.04, spinal cord 0.84 ± 0.06, right lung 0.93 ± 0.02 and left lung 0.93 ± 0.02 Maximum margins in the x, y and z axes which were needed to ensure coverage the IV when using a fast CT were (mm ± SD): Heart: X 3.4 ± 2.5, Y 0.55 ± 0.6, Z 1.6 ± 1.5 Liver: X 3.6 ± 2.6, Y 0.7 ± 0.9, Z 3.3 ± 2.3. Spinal cord: X 0.7 ± 0.37, Y 0, Z 0.8 ± 0.4. Right lung: X 2.1 ± 2.5, Y 0.7 ± 0.7, Z 2.1 ± 2.4. Left lung: X 1.9 ± 1.8, Y 0.5 ± 0.4, Z 2.4 ± 2.3. Individualized assessment of each organ by fCT + sCT allows us to have more information of the movement of each organ, and thus know more accurately the dose they receive. There are significant variations in OARs for both CT that could be result in a change in the dosimetric calculations.

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Valencia's experience in stereotactic radiotherapy for lung cancer

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Introduction. Stereotactic body radiotherapy (SBRT) has achieved excellent local control and low toxicity for lung tumors.
Objectives. Review our institution's experience in patients with medically inoperable lung tumors treated with SBRT.
Methods. Between 2002 and 2012, SBRT was used for 111 consecutive patients with 122 lung tumors. Those lung tumors included: lung cancers of any histology (76.6%), metastatic lung nodules (12.6%) or solitary pulmonary nodules suspicious of malignancy with no pathological confirmation (10.4%) but PET/CT positivity. Toxicity and radiologic response were assessed. SBRT process involved: Computed tomography (CT) simulation with stereotactic immobilization devices, contouring the target volume in 3 sets

of CTs, superimposing the volumes in the planning system to represent the internal target volume (ITV), dose calculation using heterogeneity correction and assuring very conformal distribution and radiation delivery with multiple static non-coplanar non-opposing beams and arc therapy. The prescribed dose was either 3 fractions of 14–16 Gy each or a single 30 Gy fraction (corresponding to BED > 100). Dose constraints were set for spinal cord, lung volume and organs in mediastinum.
Results. Median patient age was 71.5 years (47–86). Mean tumor volume was 6.47 cm^3 (0.6–292.7). Acute toxicities were grade 1 or 2 esofagitis, neumonitis or dermitis and occurred in 11.4% of cases. No greater toxicities were identified. The median follow-up was 18 months. The 2-year overall survival was 65% for primary tumors and 52% for all patients (disease specific survival for all patients is 59.4% and 72% for primary lung tumors). Local control in the irradiated volume is 99.1%. The marginal failure occurred in a metastatic patient with progressive multiorganic disease.
Conclusions. SBRT is an excellent treatment for lung tumors in terms of survival, local control and toxicity.

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